

WHAT IS CLAIMED IS:

1. A process for forming a three-dimensional article by stereolithography, said process comprising the steps:
 - (a) coating a thin layer of a liquid radiation-curable composition onto a surface said composition including at least one filler comprising silica-type nanoparticles suspended in the radiation-curable composition;
 - (b) exposing said thin layer imagewise to actinic radiation to form an imaged cross-section, wherein the radiation is of sufficient intensity to cause substantial curing of the thin layer in the exposed areas;
 - (c) coating a thin layer of the composition onto the previously exposed imaged cross-section;
 - (d) exposing said thin layer from step (c) imagewise to actinic radiation to form an additional imaged cross-section, wherein the radiation is of sufficient intensity to cause substantial curing of the thin layer in the exposed areas and to cause adhesion to the previously exposed imaged cross-section;
 - (e) repeating steps (3) and (4) a sufficient number of times in order to build up the three-dimensional article.
2. The process of claim 1 wherein the radiation-curable composition includes:
 - (a) at least one free-radical polymerizing organic substance;
 - (b) at least one free-radical polymerization initiator;
 - (c) at least one filler comprising silica-type nanoparticles suspended in the radiation-curable composition;
 - (d) optionally, at least one cationically polymerizing organic substance;
 - (e) optionally, at least one cationic polymerization initiator;
 - (f) optionally, at least one hydroxyl-functional compound; and
 - (g) optionally, at least one type of microparticle filler
3. The process of claim 2 wherein component (A) is at least one mono-, di-, tri-, tetra- or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic or aromatic (meth)acrylate.

4. The process of claim 2 wherein component (a) is at least one (meth)acrylate comprises a mono-, di- or tri-functional aliphatic (meth)acrylate compound.
5. The process of claim 2 wherein component (a) comprises a mono-functional aliphatic (meth)acrylate compound.
6. The process of claim 2 wherein component (a) comprises a di-functional aliphatic (meth)acrylate compound or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic, or aromatic (meth)acrylate.
7. The process of claim 2 wherein component (a) comprises a urethane (meth)acrylate.
8. The process of claim 2 wherein component (a) constitutes from about 5% to about 70% by weight of the total liquid radiation-curable composition.
9. The process of claim 2 wherein component (b) is 1-hydroxycyclohexyl phenyl ketone or 2,4,6-trimethylbenzoyldiphenylphosphine oxide or a mixture of both.
10. The process of claim 2 wherein component (b) constitutes from about 0.1 to about 7% by weight of the total liquid radiation-curable composition.
11. The process of claim 2 wherein component (c) nano-particles are spherical, have a particle size distribution of 10 to 50 nanometers, are not agglomerated, and are surface modified.
12. The process of claim 2 wherein component (c) constitutes from about 15% to about 60% by weight to the total resin composition.
13. The process of claim 2 wherein component (d) is present and comprises 3,4-epoxycyclohexylmethyl-3',4'-epoxycyclohexane carboxylate.

14. The process of claim 2 wherein component (d) is present and comprises trimethylol propane triglycidylether.
15. The process of claim 2 wherein component (d) is present and constitutes from about 10% to about 40% by weight of the total liquid radiation-curable composition.
16. The process of claim 2 wherein component (e) is present and is triarylsulfonium hexafluoroantimonate.
17. The process of claim 2 wherein component (e) is present and constitutes from about 0.1 to about 8% by weight of the total liquid radiation-curable composition.
18. The process of claim 2 wherein additionally comprising at least one (f) hydroxyl-functional compound.
19. The process of claim 18 wherein component (f) is trimethylol propane.
20. The process of claim 2 wherein component (f) is present and constitutes about 1% to about 10% by weight of the total liquid radiation-curable composition.
21. The process of claim 2 wherein the composition comprises:
 - (a) at least one mono-, di-, tri-, tetra- or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic or aromatic (meth)acrylate;
 - (b) at least one free-radical polymerization initiator;
 - (c) at least one filler comprising silica nanoparticles suspended in the composition;
 - (d) at least one cationically polymerizing organic substance selected from the group consisting of 3,4-epoxycyclohexylmethyl-3',4'-epoxy-cyclohexane carboxylate, trimethylol propane triglycidylether and mixtures thereof;
 - (e) at least one cationic polymerization initiator;
 - (f) at least one hydroxyl-functional compound; and
 - (g) at least one microparticle filler.
22. A solid three-dimensional article produced by the process of claim 1.

23. A liquid radiation-curable composition useful for the production of three dimensional articles by stereolithography that comprises:
- (a) at least one free-radical polymerizing organic substance;
 - (b) at least one free-radical polymerization initiator;
 - (c) at least one filler comprising silica-type nanoparticles suspended in the radiation-curable composition;
 - (d) at least one cationically polymerizing organic substance;
 - (e) at least one cationic polymerization initiator;
 - (f) optionally, at least one hydroxyl-functional compound; and
 - (g) optionally, at least one type of microparticle filler.
24. The composition of claim 23 wherein component (a) is at least one mono-, di-, tri-, tetra- or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic or aromatic (meth)acrylate.
25. The composition of claim 23 wherein component (a) comprises a mono-, di- or tri-functional aliphatic (meth)acrylate compound.
26. The composition of claim 23 wherein component (a) comprises a mono-functional aliphatic (meth)acrylate compound.
27. The composition of claim 23 wherein component (a) comprises a di-functional aliphatic (meth)acrylate compound or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic, or aromatic (meth)acrylate.
28. The composition of claim 23 wherein component (a) comprises a urethane (meth)acrylate.
29. The composition of claim 23 wherein component (a) constitutes from about 5% to about 50% by weight of the total liquid radiation-curable composition.

30. The composition of claim 23 wherein component (b) is 1-hydroxycyclohexyl phenyl ketone or 2,4,6-trimethylbenzoyldiphenylphosphine oxide or a mixture of both.
31. The composition of claim 23 wherein component (b) constitutes from about 0.1 to about 7% by weight of the total liquid radiation-curable composition.
32. The composition of claim 23 wherein component (c) nanoparticles are spherical, have a particle size distribution of 10 to 50 nanometers, are not agglomerated, and are surface modified.
33. The composition of claim 23 wherein component (c) constitutes from about 15% to about 60% by weight to the total resin composition.
34. The composition of claim 23 wherein component (d) comprises 3,4-epoxycyclohexylmethyl-3',4'-epoxycyclohexane carboxylate.
35. The composition of claim 23 wherein component (d) comprises trimethylol propane triglycidylether.
36. The composition of claim 23 wherein component (d) constitutes from about 10% to about 40% by weight of the total liquid radiation-curable composition.
37. The composition of claim 23 wherein component (e) is triarylsulfonium hexafluoroantimonate.
38. The composition of claim 23 wherein component (e) constitutes from about 0.1 to about 8% by weight of the total liquid radiation-curable composition.
39. The composition of claim 23 wherein additionally comprising at least one (f) hydroxyl-functional compound
40. The composition of claim 23 wherein component (f) is trimethylol propane.

41. The composition of claim 23 wherein component (f) is present from about 1% to about 10% by weight of the total liquid radiation-curable composition.
42. The composition of claim 23 wherein the composition comprises:
- (a) at least one mono-, di-, tri-, tetra- or pentafunctional monomeric or oligomeric aliphatic, cycloaliphatic or aromatic (meth)acrylate;
 - (b) at least one free-radical polymerization initiator;
 - (c) at least one filler comprising silica nanoparticles suspended in the composition;
 - (d) at least one cationically polymerizing organic substance selected from the group consisting of 3,4-epoxycyclohexylmethyl-3',4'-epoxy-cyclohexane carboxylate, trimethylol propane triglycidylether and mixtures thereof;
 - (e) at least one cationic polymerization initiator;
 - (f) at least one hydroxyl-functional compound; and
 - (g) at least one microparticle filler.